AMENDMENTS TO THE DRAWINGS

The attached three sheets of Drawings include changes to Figs. 1(a), 2 and 3. The sheet, which includes Fig. 1(a), replaces the original sheet including Fig. 1(a). The sheet which includes Fig. 2, replaces the original sheet including Fig. 2. The sheet which includes Fig. 3, replaces the original sheet including Fig. 3. In Figs. 1(a), 2, and 3, the "FFT" has been changed to --IFFT--.

Attachment: 3 replacement sheets.

REMARKS/ARGUMENTS

This case has been carefully reviewed and analyzed in view of the Office Action dated 17 September 2007.

In the Official Action, Figs. 1(a), 2 and 3 were objected to because these Figures show "FFT" instead of "IFFT". Accordingly, Figs. 1(a), 2 and 3 have been amended to replace "FFT" with --IFFT--.

Further, in the Official Action, the Abstract of the Disclosure was objected to because of the informalities found therein. Accordingly, the Abstract of the Disclosure has been amended as suggested by the Examiner.

Also, in the Official Action, the Specification was objected to because of the informalities found therein. Accordingly, the Specification has been amended as suggested by the Examiner. With regard to the requested correction on page 6, line 12, the Applicant respectfully disagrees with the Examiner's request to replace the word "block" with the word --blocks-- since in the original version the phrase "space time block encoding" is believed to be correct language.

Further in the Official Action, Claims 3-5, 8, 11, 13, 14, 16 and 17 were objected to because of the informalities found therein. Accordingly, these objected Claims have been amended as suggested by the Examiner.

In the Official Action, Claims 1-3, 6, 7, 10 and 14-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Helmut Bölcskei, et al. "Multiple-Input Multiple-Output (MIMO) Wireless Systems", further referred hereto as Bölcskei, in view of Roya Doostnejad, et al. "Space-Time Spreading Codes for a Multiuser MIMO System", hereinafter referred to as Doostnejad. Additionally, Claims 4, 12 and 13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bölcskei in view of Doostnejad and

further in view of Ian Oppermann "CDMA Space-Time Coding Using An LMMSE Receiver", hereinafter referred to as Oppermann. Also, Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Bölcskei in view of Doostnejad and further in view of Kaku, et al., U.S. Patent Application Publication 2003/0007190, hereinafter referred to as Kaku. Further, Claims 8, 11 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bölcskei in view of Doostnejad and further in view of Ezio Biglieri "Coding for the Wireless Channel", hereinafter referred to as Biglieri, and Howard Huang "Achieving High Data Rates in CDMA Systems Using Blast Techniques", hereinafter referred to as Huang. Additionally, Claim 9 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Bölcskei in view of Doostnejad and further in view of Biglieri, Huang, and Kaku.

Responsive to the rejections made in the Official Action, Independent Claims 1 and 14 have been amended to further clarify the combination of elements that define the invention of the subject Patent Application.

Bölcskei, the primary reference cited by the Examiner, is directed to a multiple-input multiple-output (MIMO) wireless systems which uses a de-multiplexer for dividing the received user's data into a plurality of parallel data streams which are sent from transmit antennas after coding and modulation to receiver antennas. The reference presents (in the Chapter "Direct Transmit Diversity") a space-time block coding technique which is applied to the data streams. The space-time block coding attains spatial diversity gain by employing multiple receive or transmit antennas and allowing for a given symbol the ability to simultaneously transmit two signals from two antennas.

The Examiner admits that Bölcskei fails to teach the space-path spreaders. To "repair" the deficiency of Bölcskei, the Examiner cites Doostnejad reference which is

related to space-time spreading codes for a multi-user MIMO system. In the chapter 2 "Spreading Matrix Design", the reference presents spreading code matrices for each user to separate the users in each group.

It is respectfully submitted that in contrast to the cited references, the present system provides the space-path spreading codes matrix which is a matrix of the predesigned space- path spreading codes which are predesigned specifically to solve the problem of multiple access interference (MAI), or inter-path interference (IPI). The multiple access interference and symbol interference in the claimed system is attained by using the space-path spreading codes predesigned to remove the interferences. The space-path spreading codes are also specifically designed to attain paths multiplexing by anticipatively equalizing channels of the paths.

As presented on page 13 of the current Patent Application, "the pre-designed space-path spreading codes can effectively suppress the multiple access interference and symbol interference by using the space-path spreading codes to remove the interferences." This is presented in Eq. 8

$$c_{q,l}^{H} t_{k,p} = 1, \qquad q = k, l = p$$
$$c_{q,l}^{H} t_{k,p} = 0, \qquad otherwise$$

wherein $l = 1,2,\ldots,L$, $p = 1,2,\ldots,L$, $k = 1,2,\ldots,K$,

$t_{k,p}$ – are space-path spreading codes, and

$c^{H}_{q,l}$ – is the despreading vector.

The feature of pre-designing the space-path spreading codes to pre-suppress MAI and to equalize multiple paths is completely missing in the cited reference.

Referring to page 9 of the current Patent Application, the coded parallel data

streams are individually passed to the space-path spreaders 14. This feature is also missing from the cited reference.

Further, in Doostnejad, no teaching of different and orthogonal space-path spreading codes is presented. For this, the Examiner cited Oppermann Publication "CDMA Space-Time Coding Using an LMMSE Receiver." The reference suggests that the signal from each antenna consists of orthogonal signal components, and that each code symbol uses a different spreading sequence. Using different spreading sequences for each transmitted symbol, some use may be made of orthogonality of the combined received signal on a direct component.

It is respectfully submitted that even though Oppermann suggests orthogonal signal components and different spreading sequences, the reference however fails to present that space-path spreading codes are different and orthogonal space-path spreading codes predesigned to suppress multiple access interference (MAI) and to attain the equalization of the multiple paths. Oppermann is mainly concerned with attaining significant gains in view of independent fading of all transmit/receive channels (p. 182, right column, 2nd paragraph), and does not consider pre-designing of space-path spreading codes to suppress MAI and to equalize the multiple paths.

The Kaku reference was cited by the Examiner solely for the purpose of showing the data transferred to the transmit antennas after being transformed to a time domain with Inverse Fast Fourier Transform (IFFT) and having a guard time added.

It is respectfully submitted that although showing transformation of the signal by IFFT, this reference, in contrast to the present system, however, is not a multi-input multi-output multi-carrier code division multiple access communication system employing a de-multiplexer, space-time block encoders, and plurality of space-path

spreaders each individually receiving output data from the space-time block encoders and applying thereto space-path spreading codes predesigned specifically to suppress MAI and to equalize multiple paths.

Biglieri, another prior art cited by the Examiner, is directed to coding technique for the wireless channel and was cited by the Examiner for teaching a plurality of receive antennas for receiving data transmitted by the transmit antennas, a space-time linear combiner, and a BLAST detector separating mutually interfering signals from the multiple transmit antennas.

Huang, a further cited reference, is a communication system using BLAST technique and was cited by the Examiner for teaching a plurality of matched filters individually receiving data received by the receive antennas and despreading it in accordance with the space-path spreading code.

It is respectfully submitted that neither of these references, Biglieri or Huang, suggests or renders obvious the MIMO multi-carrier code division multi-access communication system which uses space-path spreading codes specifically predesigned to anticipatively suppress the multiple-access interference and to equalize the multiple-paths as it is in the present system.

Further in the claimed system and method, "... a number of ... space-path spreaders in relationship to a number of ... space time block encoders..." is selected "...to adjust a diversity gain and transmission speed ...". This is presented on page 16, line 11 – p. 17, line 6, as well as it is shown in Figs. 2 and 3 of the Application in question. This feature is completely missing from the cited prior art, taken singly or in any combination.

The combination of elements of the present system, as well as of the method, in which space-path spreaders individually receive data streams from the space-time block encoders and spread the latter with different and orthogonal space-path spreading codes predesigned specifically to pre-suppress multiple access interference (MAI) and to pre-equalize multiple paths in the communication system, and wherein the diversity gain and transmission speed is adjusted by selecting the relationship between space-time block encoders and space-path spreaders, as now claimed, is not found in either of the cited references, nor are they obvious in view of the cited references, taken solely or in any combination.

It is respectfully submitted therefore that the pending Independent Claims 1 and 14 are patentably distinct over the cited prior art, taken singly or in combination. Accordingly, Claims 1 and 14, as amended, are believed to be allowable; and the same is respectfully urged.

Claims 2-3, 5-11, and 13 depending upon Claim 1, and Claims 15-17 depending upon Claim 14 each adds further limitations that are patentably distinct in addition to be dependent upon what is now believed to be a patentable base claim, and therefore allowable for at least the same reasons.

Claim 4 has been canceled without prejudice to incorporate the subject matter thereof in to Claims 1 and 14.

Thus it is believed that the subject Patent Application has now been placed fully in condition for allowance, and such action is respectfully requested.

If there are any further charges associated with this filing, the Honorable Commissioner for Patents is hereby authorized to charge Deposit Account #18-2011 for such charges.

Respectfully submitted,
For: ROSENBERG, KLEIN & LEE

/Morton J. Rosenberg/

Morton J. Rosenberg
Registration #26,049

Dated: 15 February 2008

Suite 101
3458 Ellicott Center Drive
Ellicott City, MD 21043
(410) 465-6678
Customer No. 04586

CERTIFICATE OF ELECTRONIC TRANSMISSION

I hereby certify that this paper is being transmitted electronically to the U.S. Patent and Trademark Office, Art Unit # 2609, on the date shown below.

For: ROSENBERG, KLEIN & LEE

/David I. Klein/ 2/15/2008
DAVID I. KLEIN Date